

ABSTRACT OF THE DISCLOSURE

A method for use in the fabrication of integrated circuits includes providing a substrate assembly having a surface. A diffusion barrier layer is formed over at least a portion of the surface. The diffusion barrier layer is formed of RuSi_xO_y , where x and y are in the range of about 0.01 to about 10. The barrier layer may be formed by depositing RuSi_xO_y by chemical vapor deposition, atomic layer deposition, or physical vapor deposition or the barrier layer may be formed by forming a layer of ruthenium or ruthenium oxide over a silicon[]-containing region and performing an anneal to form RuSi_xO_y from the layer of ruthenium and silicon from the adjacent silicon[]-containing region. Capacitor electrodes, interconnects or other structures may be formed with such a diffusion barrier layer. Semiconductor structures and devices can be formed to include diffusion barrier layers formed of RuSi_xO_y .